Ownership matrix

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1.0 PURPOSE AND SCOPE

This procedure describes the steps for developing, updating, reviewing, and issuing the Design Requirements Compliance Matrix (DRCM) which is used, in part, for implementing the Tank Operations Contractor (TOC) Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Program. The ITAAC Program is a structured method for verification that facility modifications and projects are designed, built, and tested to meet selected requirements.

The DRCM contains the set of requirements that are applied to the design of a system or subsystem. These requirements are developed through engineering activities such as described in TFC-ENG-DESIGN-C-01. Formal decisions to include engineering design within the ITAAC Program and thus develop the DRCM is defined in the specific project execution plan prepared in accordance with TFC-PLN-84. Implementation of this DRCM procedure may require tracking requirements, along with verification methods and acceptance criteria through the engineering, construction, testing, and commissioning stages of a project. Completion of the DRCM table, including the verification input, confirms that the design meets the requirements and has been demonstrated to do so via a structured acceptance methodology.

Full completion of the DRCM table requires integrated project activity extending beyond the engineering discipline. Combined activities among several organizations (engineering, construction, operations, testing, and commissioning) are needed to confirm the functionality of the engineered system or product. The DRCM is not a design document per se, but rather a linking or connecting document to track requirements from their inception to completion.

2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header. This revision applies to all new projects. On-going projects that have not completed their final design may be designated for the ITAAC process by the Chief Engineer. ITAAC projects are so designated by the WRPS Chief Engineer and concurred with by the WRPS Construction & Commissioning Manager and the WRPS Manager of Projects.

The ITAAC process does not apply to projects or work already in progress with an issued DRCM, or those not designated ITAAC by the Chief Engineer.

3.0 RESPONSIBILITIES

Responsibilities are contained within Section 4.0.

4.0 PROCEDURE

See Figure 1 for the Design Requirements Compliance Matrix process.

4.1 General Requirements

The requirements in the Design Requirements Compliance Matrix apply to all DOE O 413.3 projects covered by TFC-PRJ-PM-C-02 and expense-funded projects covered by TFC-PRJ-PM-C-11, regardless of safety classification. (This excludes maintenance activities and operations' replacement in-kind activities.)

The Design Requirements Compliance Matrix (DRCM) is used to implement the TOC Inspections, Tests, Analyses, and Acceptance Criteria Program.

For an individual design project or task, the decision to implement the ITAAC Program using the DRCM procedure is governed by TFC-PRJ-PM-C-02 and documented in the specific project execution plan, in accordance with TFC-PLN-84. The DRCM procedure meets the requirements of TFC-PLN-98 (ITAAC Program Plan).

The DRCM provides a single point of reference for design requirements which may come from a number of sources such as design specifications prepared in accordance with TFC-ENG-DESIGN-C-01. Additional requirements may come from existing Documented Safety Assessment (DSA) assumptions or limits when the design may potentially affect these parameters. Environmental permitting requirements should also be considered. If the design may affect other existing project technical assumptions or limits, these should also be included in the DRCM.

4.2 Organization of the DRCM

The DRCM is allocated based on the ITAAC Program Plan requirements and includes the information required for that program; however the table may include additional fields and information as needed to assist in organization and tracking of requirements. Attachment A provides an example of the required fields which are:

- Requirement ID: Provides a unique identification tag for each requirement.
- Requirement Source: Provides the specific reference to the requirement in a source document.
- Requirement text: Provides the specific text of the requirement as extracted from the source. When the requirement text is not suitable for extraction, a summary may be made, or reference made as necessary to figures or tables in the source document. This section should include any design assumptions made regarding the requirement.
- Category: To assist in review and planning for project activities needed to verify requirements are met, each requirement should be organized into one of the following categories:
  - Structural systems
  - Piping systems and components
  - Instrumentation and controls
  - Electrical systems
  - Heating, ventilation, and control (HVAC)
  - Chemical processes
  - Radiation protection
  - Emergency planning
  - Environmental compliance
  - Safety and health.
- Inspections, Tests, and Analyses (Verification Method): Identification of the proposed method (inspection, testing, analysis, or some combination of all three) by which the

design commitment will be verified. If the analysis method is a design review or calculation include in the table, include the organization(s) which will perform the work.

- Acceptance Criteria: Identify the specific acceptance criteria and basis for the inspections, tests, or analyses used for each requirement that when met will confirm the design requirement/commitment has been demonstrably satisfied.

- Requirement Flowdown: This field is used to document how requirements from upper tier documents are passed down into lower tier requirements document, as well as to subcontractor documents when applicable.

- Verification Documents: This field references the documents and evaluations that contain the information demonstrating the requirements were satisfied; these documents may be items such as test reports, inspection reports, engineering calculations, design reviews, etc. This field should also include the confirmation or closure of design assumptions made for the requirement.

4.3 Prepare the Preliminary DRCM during the Preliminary/Conceptual Design Phase

The preliminary DRCM is prepared during the Preliminary or Conceptual Design Phase and used for project planning for engineering, testing, inspection, and procurement activities as needed to verify the completed design. The preliminary DRCM is intended as a tool for project planning among several organizations involved in the overall verification: Engineering, Testing, Commissioning. Using the philosophy of a graded approach, the Project Manager may decide to prepare the DRCM in the initial engineering phase, but defer the initial formal release of the DRCM until the final design phase for less complex designs. See Attachment B for more information on populating the DRCM. This decision should use the guidance provided in the TFC-PRJ-PM-C-03 (project tailoring approach), and be documented in the Project Execution Plan. The Project Execution Plan may only require a final DRCM. In that case a preliminary version of the DRCM is not required. It is anticipated that an ITAAC project will always require a preliminary DRCM.

Project Engineer (or as designated by the Responsible Engineering Manager)

1. Using the requirements identified in development of specifications, populate the DRCM with requirements. Organize the requirements into the categories from Section 4.2.

2. For each requirement, identify the method or methods that will be used to confirm verification of the design to meet the requirement.

   NOTE: These methods may be multiple for an individual requirement. A verification method may be an engineering activity such as an analysis; however, verification methods may be produced by other project organizations such as Procurement, Construction, Test Program, and Commissioning. The engineer should engage other project organizations as necessary when defining appropriate verification methods.

3. For each requirement's verification method, identify acceptance criteria and document them in the DRCM.

NOTE: In developing the acceptance criteria, the engineer should engage other organizations as needed to delineate the acceptance criteria necessary to confirm the design verification method adequately verifies that the design requirement is confirmed in the designed system.

4. Issue the preliminary Design Requirements Compliance Matrix as an engineering document in accordance with TFC-ENG-DESIGN-C-25.

NOTE: Using a graded approach for less complex designs, the Project Manager and Project engineer may prepare the DRCM during the initial project design, but defer the initial formal release until the Final Design Phase.

4.4 Preparing and Issuing the DRCM During the Final Design Phase

Project Engineer (or as designated by the Responsible Engineering Manager)

1. Update the Design Requirements Compliance Matrix with any additional requirements or information arising during the final design phase.

2. Conduct a design requirements compliance review by completing a Design Requirements Compliance Matrix and conducting a review in accordance with methods defined in Sections 4.3 – 4.7 of TFC-ENG-DESIGN-P-17.

NOTE 1: The DRCM Review should include input or representation from other organizations responsible for verification activities such as testing or commissioning activities. The initial DRCM establishes the engineering requirements along with the agreed plan and associated acceptance criteria for demonstrating that the completed design meets the established requirements.

NOTE 2: The initial project Design Requirements Compliance Matrix must be prepared prior to completing final design activities on the project.

3. Issue the initial Design Requirements Compliance Matrix as a revision of the engineering document from Section 4.3.4 in accordance with TFC-ENG-DESIGN-C-25.

NOTE: Additional project Design Requirements Compliance Matrix updates shall be performed as determined by the project engineer (or as designated by the responsible engineering manager) with the concurrence of the project manager. Depending on the magnitude of the changes, the responsible engineering manager may require additional reviews prior to update. Upon decision to update the DRCM, it should be issued as a revision to the engineering document established in step 3 in accordance with TFC-ENG-DESIGN-C-25.

4.5 Preparing and Issuing the Completed DRCM with All Verifications Included

Design Originator/ Responsible Manager

1. Upon completion of the verification activities listed in the Design Requirements Compliance Matrix, update the DRCM "Verification" field to include for each requirement the assessment of results as compared to the acceptance criteria, confirmation that the acceptance criteria were satisfied, and reference to the appropriate documents such as test reports, inspection reports, engineering analyses, etc., where the verification results are documented.

2. Conduct a verification design requirements compliance review on the revised/updated information in the Design Requirements Compliance Matrix in accordance with methods defined in Sections 4.3 – 4.7 of TFC-ENG-DESIGN-P-17. The DRCM Review should include representatives from other organizations responsible for verification activities. The DRCM Review must include assessment that the verification activities have been completed and the associated acceptance criteria have been met and documented.

3. Issue the completed Design Requirements Compliance Matrix (with confirmed verifications in the "Verification" field) as a revision in accordance with TFC-ENG-DESIGN-C-25. It is anticipated that the completed DRCM would be issued in parallel with or following the Test Results Report (TRR) issued by the Test Director per TFC-PRJ-SUT-C-04. Any "TBDs" or "Holds" necessary on the DRCM should be tracked and managed per TFC-ENG-DESIGN-C-25.

5.0 DEFINITIONS

Acceptance criteria. Refer to the performance, physical condition, or analysis result for a structure, system, or component (SSC), which demonstrates that the design requirement/commitment is met.

Analysis. A calculation, mathematical computation, or engineering/technical evaluation. This definition also includes design review and alternate calculation from the design verification process in TFC-ENG-DESIGN-P-17.

Design requirement/commitment. That portion of the detailed design information provided in the design basis documents that is verified by ITAAC Program as implemented in the DRCM procedure.

Design Requirements Compliance Matrix (DRCM). The design document that contains, for an engineering design, the table of design requirements along with fields (columns) for source document reference, requirement text, verification methods, acceptance criteria for verifications, and documented information and references that the acceptance criteria were met. The DRCM may contain additional fields to assist in tracking and management of the design verification process. The DRCM is the engineering document that implements the ITAAC program. The DRCM is not a design document.

Inspections, Tests, Analyses and Acceptance Criteria (ITAAC). A process for the identification of design, inspection and testing requirements, with verification through inspection, analyses, testing or a combination thereof and closure based upon defined acceptance criteria.

Inspect or inspection. Visual observations, physical examinations, or reviews of records that compare the SSC condition to one or more design commitments/requirements. Examples include walkdowns, configuration checks, measurements of dimensions, or NDEs.

Test. Actuation or operation, or establishment, of specified conditions to evaluate the performance or integrity of as-built SSCs. Tests included in the DRCM as part of verification of requirements may include technology demonstration tests, factory acceptance tests, construction acceptance tests, qualification tests, component-level, system-level or integrated tests.

6.0 RECORDS

The following records are generated by the performance of this procedure:

Record Description	Vital Record Y/N	QA Record Y/N	QA Record Retention L/NP	NARA Retention Schedule	Other Retention Requirements	Records Custodian
Design Requirements Compliance Matrix	N	Y	L	ADM-17.32a	N/A	Design originator

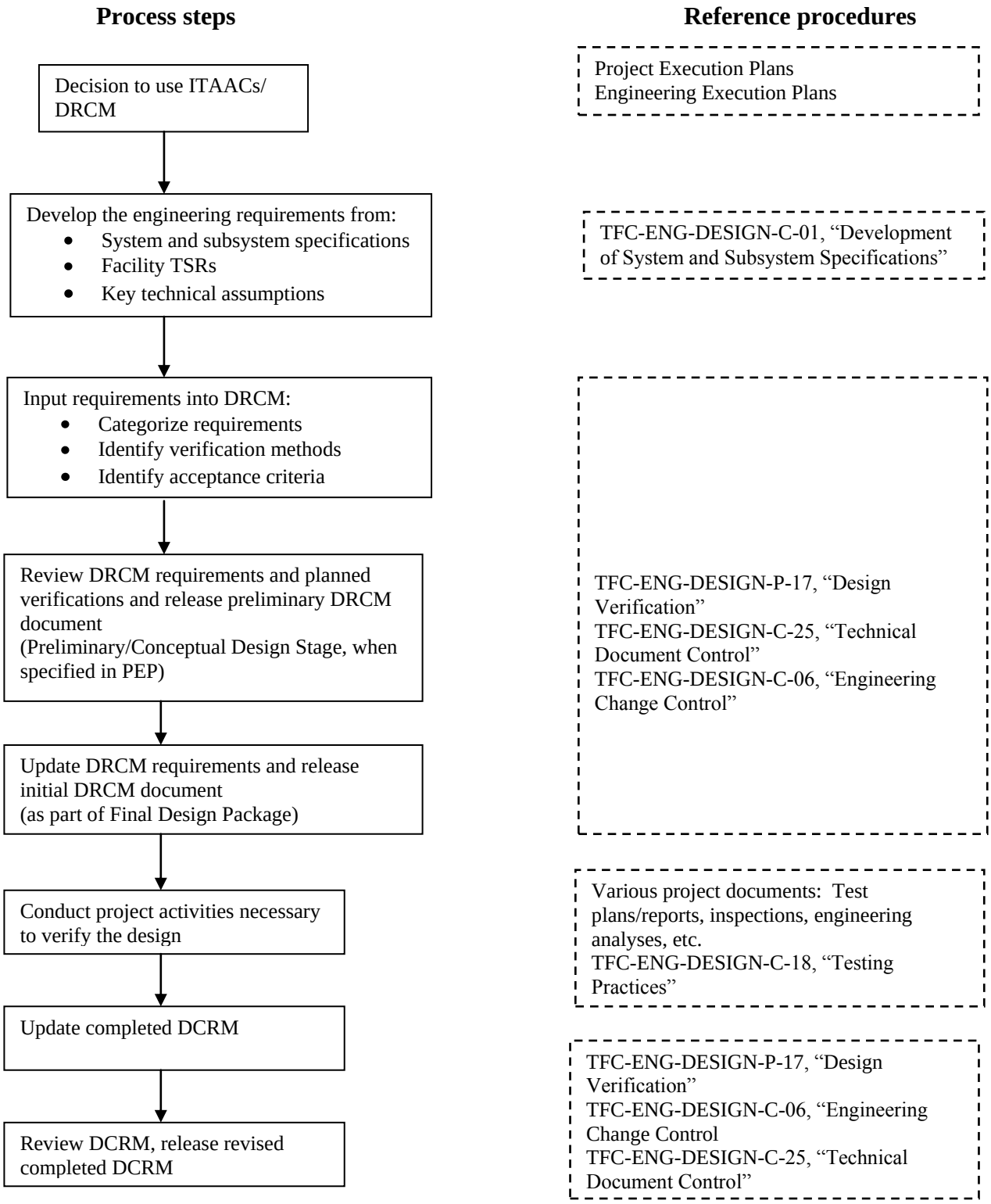
The identified record custodian is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.

7.0 SOURCES

7.1 References

1. TFC-PLN-98, “Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Program Plan.”
2. TFC-ENG-DESIGN-C-06, “Engineering Change Control.”
3. TFC-ENG-DESIGN-C-01, “Development of System and Subsystem Specifications.”
4. TFC-ENG-DESIGN-P-17, “Design Verification.”
5. TFC-ENG-DESIGN-C-25, “Technical Document Control.”
6. TFC-ENG-SB-C-03, “Unreviewed Safety Question Process.”
7. TFC-ENG-SB-C-06, “Safety Basis Development.”
8. TFC-PRJ-CM-C-02, “Project Management.”

Figure 1. Design Requirements Compliance Matrix Process.



ATTACHMENT A – WRPS DRCM TABLE INFORMATION

Example DRCM / ITAAC table
Reference: Appendix B, 241-C-200-Series Waste Retrieval System DRCM (Actual DRCM table entries have been modified to include ITAAC fields and format.)

Req ID	Requirement Source	Requirement Text	Category	Verification method (Inspection, test, analyses, design review, or calculation)	Verification status	Acceptance Criteria	Requirement Flowdown	Verification Documents
101	OSD-T-151-0013	Maintain vapor space within limits defined in SST operating specification.	HVAC systems	Design review of report section	Verified	per SST operating specification	NOC AIR 03-704 RPP-15470, Sec 4.2.2.1 RPP-16525	RPP-15252, Sec 2.1 & 2.4 (exhauster set points)
				Qualification testing	Verified	per SST operating specification		C-200-OAT-1.0.1 Rev 0-A
102	RPP-14075, 3.1.2.1	200 Series Tanks in 241-C Tank Farm. The C 200 WRS shall interface with each of the 241-C 200 Series Tanks by means of risers (see drawing H-14-010613, Sheet 3). Risers not in the pit are accessed above grade. The interface point with the risers is generally a standard flange or is defined in the applicable drawings. The C-200 WRS existing risers may be off vertical and/or out of round.	Structural systems	Design review of drawings	Verified	As stated in requirement text	Req # 96812, Sec 16.0	H-14-105283-2 (Riser 011, C-201 thru C-204) H-14-105284-1 (Riser 005, C-201 thru C-204) H-14-105978-1 (Riser 007, C-201 thru C-204) H-14-105995-1,2 (Riser 006, C-201) H-14-105996-1,2 (Riser 006, C-202) H-14-105997-1,2,3,4 (Riser 006, C-203) H-14-105998-1,2 (Riser 006, C-204) H-14-106126-3,4,5,6 (P&IDs for C-201 thru C-204) H-14-106132-1 (Interface Control)

Categories

- Structural Systems
- Piping Systems and Components
- Instrumentation and Controls
- Electrical Systems
- Heating, Ventilation, and Control (HVAC)
- Chemical Processes
- Radiation Protection
- Environmental Compliance
- Safety and Health

ATTACHMENT B – DRCM REQUIRED AND SUGGESTED INFORMATION FIELDS

The following list contains required and suggested table fields (columns) that should be considered for inclusion in the DRCM table, along with supporting information for some of the fields.

Items in Bold are required for the DRCM table:

- **Requirement number:** It is recommended that requirements be uniquely numbered as a standard practice which makes referring to them easier. Unique identification is required if using in a database format which may become desirable for some projects.

- **Requirement source document & section identifier:** Identify the source document of the requirement and the section identifier. (If desired, these can be placed in separate fields.).

- **Requirement text:** Extract the text of the requirement. Include a description of any design assumptions made for this requirement.

- **Categorization:** Identify the relevant engineering discipline to assist in design verification activities.

  – Structural systems
  – Piping systems and components
  – Instrumentation and controls
  – Electrical systems
  – Heating, ventilation, and control (HVAC)
  – Chemical processes
  – Radiation protection
  – Safety and health
  – Emergency planning
  – Environmental compliance.

- **Verification method (analyses, tests, inspections):** Method(s) used to confirm requirement is met. A single requirement may have multiple methods of verification.

- **Verification status:** Provide status whether the verification of the requirement is complete.

- **Acceptance criteria for verification:**

  – In some cases the acceptance criteria is implicitly the same as the requirement wording itself. In such instances it may be appropriate to word that the acceptance criteria is that a document or drawing will be produced and will conclude (or will be confirmed by design review to show) that the requirement has been satisfied. For example a piping requirement may be that a piping system must conform to ASME B31.3 which is a code embodying a substantial body of individual requirements. In such a case, a document is typically produced that provides background analyses for piping and support design. This document may also need to contain, or be supplemented by other documents, that provide documentation that the pipe welds have been inspected per code, that installed piping has been hydro-tested, etc.

ATTACHMENT B – DRCM REQUIRED AND SUGGESTED INFORMATION FIELDS (cont.)

- The previous strategy may apply to other analogous cases. For example, where a design needs to meet structural or seismic codes or requirements, an analysis/calculation may be produced to define mechanical/structural design features, and an inspection may be used to confirm these features exist in the as-built plant as defined on the drawings.
- In other cases, where some items are required to exist or be in some configuration, an acceptance criterion may be identified as being an inspection that confirms the configuration.

- **Requirement flowdown:** This field is used to document how requirements from upper tier documents are passed down into lower tier requirements document, as well as to subcontractor documents when applicable.
- **Verification document(s):** Provide the references to documents where objective evidence is found showing requirements are met per the acceptance criteria.
- **Verification text:** support text providing information regarding the verification.
- **Design review document:** Where applicable, this could contain the design review document number or meeting minutes number for the design review at which the requirement was reviewed and judged to be met.
- Responsible persons or organizations.
- Verification status.
- Closure or confirmation of design assumption.
- Comment/note.